

CHAPTER 9. TUMOURS OF BONE

Tumours Of Bone
Reactive Bone Lesions
Hamartomas
Cystic Lesions In The Bone
Osteogenic Tumours
Chondrogenic Tumours
Fibro-Histiocytic Tumours
Myelogenic Tumours
Bone Metastasis

CHAPTER 9. TUMOURS OF BONE

TUMOURS OF BONE

Management of Bone. Tumours forms an important segment of orthopaedic practice because of the high rate of mortality in the malignant bone tumours and the high morbidity after ablational surgery or radiation therapy. The incidence of bone tumours is very low (1 to 1.5% of the total malignancies in the body).

In clinical practice true neoplasms of bone will have to be differentiated from hamartomas and reactive bone lesions.

The group of lesions which show abnormal proliferation of cell which soon mature and stop proliferation are called *Hamartomas*. These are really benign *growth disorders* and examples are osteochondroma, osteoma and enchondroma.

Bone also reacts to many types of injury by new bone formation and this *Reactive* or *Reparative Tissue* can also simulate neoplasia histologically.

One must remember that clinically, certain non neoplastic lesions present as swellings in the bone simulating a tumour e.g. Solitary bone cyst, fibrous dysplasia. Brown tumour lesion in Hyperparathyroidism etc.

Thus, the diagnosis of bone tumour can be often very difficult. Accurate diagnosis is very important as a mistaken diagnosis of a malignant bone tumour can lead to a very unfortunate result like an unnecessary amputation of the limb.

CLASSIFICATION

True bone tumours can be benign or malignant. A malignant bone tumour is a progressive, invading, metastasizing and nonmaturing proliferation of the cells of the bone tissue.

Bone being a tissue of mesenchymal origin, the abnormality of cell growth can produce a tumour containing not only bone but also cartilage and fibrous tissue in varying degrees. All these are derived from the *primitive multipotent mesenchymal cell*. There is also a group of myelogenic tumours arising from the derivatives of the marrow reticular tissue.

The classification of bone tumours is still not perfect but the following groupings based on their clinical presentation are useful for diagnostic

purposes. Non inflammatory lesions in the bone may be broadly grouped into Tumour like lesions and True bone tumours.

TUMOUR LIKE LESIONS OF BONE

I. Reactive bone lesions simulating tumours

- a. Osteoid osteoma
- b. Benign osteoblastoma
- c. Non osteogenic fibroma

II. Hamartomas of bone

- a. Osteoma
- b. Osteochondroma
- c. enchondroma

III. Cystic lesions in bone

- a. Solitary bone cyst
- b. Aneurysmal bone cyst

TRUE BONE TUMOURS

1. Primary Bone Tumours

- a. Osteogenic
Osteosarcoma
- b. chondrogenic
Chondroblastoma
Chondro myxoid fibroma
Chondrosarcoma
- c. Fibro-histiocytic (Connective tissues)
Fibrosarcoma

Malignant Fibrous Histiocytoma

d. Myelogenic

Plasma cell myeloma
Ewing's tumour
Lymphoma of bone

e. Osteoclastoma (Giant cell Tumour)

SECONDARY MALIGNANT DEPOSITS IN BONE

From Primary in:

- Thyroid
- Breast
- Bronchus
- Kidney
- Prostate

A histogenetic classification of bone is based on the type of cell from which a tumour in the bone arises. This is useful to understand the *pathogenesis* of the tumour. Tumours of the bone arise from any of the following type cells constituting bone tissue such as osteoblast, chondroblast and fibroblast. The following the classification based on the basic tissue cell type giving rise to the tumour under general groupings as Benign and Malignan.

On the above hasis the bone tumour could be classified as given in the following Table.

TABLE

Tissue and Cell Type	Benign	Malignant
I. Bone Tissue		
a. Osteoblast	Osteoma Benign Osteoblastoma	Osteosarcoma
b. Chondroblast	Chondroma Chondroblastoma	Chondrosarcoma
c. Fibroblast	Fibroma Non Osteogenis Fibroma	Fibrosarcoma Malignant Osteoclastoma
d. Osteoclast	Osteoclastoma	Malignant Osteoclastoma

II. Periosteal Tissue

Fibroblast

Periosteal Fibroma
Desmoplastic Fibroma
of Bone(Desmoid)

Periosteal Fibrosarcoma
Malignant Fibrous
Histiocytoma

III. Bone Marrow Tissue

a. Undifferentiated Marrow Cell

Ewing's sarcoma

b. Plasma Cell

Solitary Myeloma
Multiple Myeloma

c. Reticulo Endothelial Cell

Reticulum Cell sarcoma

d. Vascular Tissue

Haemangioma

e. Adipose Tissue Fat Cell

Lipoma

f. Nerver Tissue

Neurofibroma

IV. Synovium

Tumours arising from
pre-existing begin lesion

Paget's sarcoma

DIAGNOSIS

The exagnosis of a true tumour of the bone is very important both in therapeutic and prognostic considerations. It is based on 1. clinical examination. A thorough clinical examination eliciting the history and physical signs is the first essential examination. A thorough clinical examination eliciting the history and physical signs is the first essential step. 2. Imaging technology from plain radiography to the modern imaging technologies. 3. Laboratory investigations. 4. Biopsy.

Imaging

Plain radiography still has big role to play in arriving at accurate diagnosis, on the basis of five parameters.

1. The anatomical location of the lesion.

The tumour can be grouped according to th anatomical location as follows:

Diaphyseal : e.g. Ewing's Sarcoma

Types of Biopsy

Open Biopsy Closed Biopsy

Open Biopsy

Open biopsy has been the conventional method requiring an incision under operating room conditions. Select the least differentiated or least mineralised portion of the neoplasm. Since this is usually the most representative portion of a malignant lesion. The periphery of any malignant tumour is the most viable and diagnostic portion of the tumour, whereas the central region is often necrotic. A correctly placed biopsy incision must be capable of being excised en bloc with a malignant tumour when a surgical procedure i.e. limb sparing operation is contemplated.

Closed Biopsy

A closed biopsy implies that no incision is required and that the tissue specimen is obtained through skin puncture by a needle or trephine. It can be done under local anaesthesia and minimises tissue contamination. Nowadays trocar biopsy is used widely. It cannot be done in osteosclerotic bone tumours. Mittal (Patiala) has devised the Patiala biopsy needle which is used for closed biopsy.

CT Assisted Needle Biopsy

Accurate localisation of the tumour in sites like the spine and pelvis by CT enable closed biopsy of these lesions. This avoids major surgical procedures for biopsy purposes. This can also be done with image intensifier.

GRADING AND SURGICAL STAGING SYSTEM

With progress in the Radiotherapeutic modalities and more effective Chemotherapy, better therapeutic programmes are now possible. In this situation it becomes necessary to have a Staging system for the bone tumours accepted internationally as in the case of Soft tissue malignancy.

Enneking (1980) has evolved a system of Surgical Staging of bone tumours. This is based on the histological grade (G) anatomical location (T) and the presence of secondary metastasis (M) This system provides guidelines and protocol for surgical and other therapy as well as for assessing prognosis.

Grade (G)

Grade 1. lesion are those with low grade malignancy. Histologically they show few mitosis little anaplasia and cellular atypia Grade 2 are of high grade malignancy. They show poorly differentiated cells with marked atypism and pleomorphism. Cells are hyperchromatic with more frequent mitosis.

Site (T)

The second parameter standardised by Enneking is the anatomical location in relation to the tissue compartments. T1 lesion is intra compartmental confined within the cortical boundaries of a bone like femur of tibia. In extracompartmental (T2) lesions, the natural barriers are crossed and the lesion involves more than one compartment.

Metastasis (M)

M0 and M1 refers to the absence or presence of metastasis.

Surgical Stages

SURGICAL MARGINS

